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46. SANDALWOOD NURSERY PROBLEMS AND REMEDIAL MEASURES IN WEST TIMOR

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Production of sandalwood (*Santalum album*, Linn) in West Timor has decreased during the last 20 years, thought to be due to mismanagement (over-exploitation in the past), inadequate plantation establishment techniques, and lack of support or disobedience of local communities in planting and maintaining sandalwood trees. This was related to a regulation (*perda*) stating that the exclusive property right over the sandalwood trees and wood rested with the provincial or local government regardless of the place where it grew. This in turn has caused sandalwood stock to decrease steadily (Widiyatmika 1986, Harisetijono 2002, Rahayu, 2002). The situation has also been aggravated by stringent legal control and centralised authority on sandalwood resource management and utilization and trade, which has resulted in the low interest of the private sector towards investing in the sandalwood plantations. The hope of successful sandalwood tree restoration depends on community participation to establish plantations on their own land. Most sandalwood trees have been grown on private or community land (90 %), with only 7% grown on state land (Ardjoyuwono 1986). The main problem for community participation to establish sandalwood plantation is the low quantity and quality of sandalwood seedlings (Rahayu 2006). A negative perception of management policy (monopoly) by the government is no longer a problem, especially on Sumba Island. Local people can be encouraged to establish sandalwood plantations on their own land by providing high quality sandalwood seedlings. The highest survival rate in field observations is only 57.1% with the host plant of *Desmanthus vulgaris*, probably due to low seed quality.

PROBLEMS IN PROVISION OF SANDALWOOD SEEDLINGS

Although much research has been conducted on sandalwood silviculture, provision of seedlings still presents many problems, especially in the nursery stage. Some common problems are now discussed.

Low Quality of Seed

Quality of seed depends on conditions of mother trees. The ideal mother tree should be more than 20 years old, healthy and having high santalol. The decreasing number of sandalwood mother trees stocked makes obtaining high quality seed difficult.

Competition for Nutrients

Sandalwood is hemyparasite plant, meaning that the plant should have a host which provide some nutrients for the sandalwood plant. Nutrition competition arises between sandalwood and the host plant. Plantation performance for several host plant species is reported in the Table 1.

Table 1. The influence of host plant on the growth of sandalwood seedlings and after outplanting

Host plant species	Performance in nursery (8 months)		Performance in the field			
	Average height (cm)	Average diameter (cm)	Average height (cm)	Diameter average (cm)	Survival rate (%)	Survival order
Capsicum frutenscen	27.40	0.31	169.15	1.68	21.72	6
Sesbania grandiflora.	23.31	0.34	141.14	1.40	20.00	5
Duranta refans	21.64	0.24	196.75	1.73	48.57	4
Althenanthera spp	43.77	0.45	170.07	1.75	44.18	2
Acacia oraria	23.27	0.30	108.86	1.08	22.50	9
Breynia cerua	25.65	0.27	148.29	1.54	36.67	7
Crotalaria juncea	43.43	0.39	154.30	1.65	27.50	3
Desmanthus vulgaris	44.60	0.40	205.93	2.22	57.14	1
Cajanus cajan	28.86	0.29	104.65	1.14	30.00	8

Source: Surata (1993).

Lack of Water

The moisture content of seedling media is an important factor in sandalwood seedling nurseries. High humidity will decrease the aeration condition such that it is unsuitable for sandalwood seedling growth. Therefore, the regulation of moisture content plays an important role in producing high quality seedlings.

Seedling Medium of Germination

The type of sowing medium can influence the aeration and drainage capacity and both will influence the survival of seedlings. Some treatments about medium factors are explained in Table 2. Sandy material was the better medium for germination and the lowest germination percentage was on soil material. This factor related to the aeration, drainage and temperature condition.

Table 2. The influence of type of sowing medium on the seed germination rate

Type of medium	Germination rate (%)
Soil	30.67
Sand	81.33
Sawdust	77.33
Faecal of cow	70.66

Source: Surata (1990).

Sunlight Intensity

Sandalwood needs shade in the nursery. High intensity of light can kill the seedling. The influence of sunlight intensities can be seen in Table 3. Shading leads to a higher survival rate, except in the case of shading with *Acacia villosa*.

Table 3. The influence of shading type on the growth of 8-months old young plantation

Treatment	Height average (cm)	Diameter average (cm)	Survival rate (%)
Control	43.12	0.61	56.00
Shade with *Imperata cylindrical*	39.54	0.58	71.87
Shade with maize and *kacang turis*	56.63	0.59	71.99
Shade with *Acacia villosa*	56.43	0.59	57.81
Shade with *kacang turis*	70.32	0.71	84.38

Source: Surata (1993).

Pests and diseases

The common disease in nurseries is *londoh* (a whitish decay fungi) and the most common pest is leaf worm, both of which can quickly kill a large number of seedlings.

Quality of Human Resources and Management Institution

Most of the local communities and official governments do not have the knowledge, skill and technology to develop sandalwood plantations. The institution for developing sandalwood plantations are not well organized. Individual stakeholders have already tried to develop plantations in their own way without coordination with each other. Therefore, it is difficult to find an area of sandalwood plantation with good growth anywhere in the field. This is also due to the misunderstanding of policies between institutions.

These above problems need to be solved before encouraging communities to establish sandalwood plantation on their own land.

PROPOSED SOLUTIONS TO SANDAL WOOD SEEDLING PROBLEMS

Sandalwood seedling problems as described above can be solved by conducting some techniques and research, including:

1. Low seed quality can be solved by selecting the seed before planting. Desirable physical qualities of seed include relatively large size, light brown colour and white flesh.
2. Nutrition competition can be solved by cutting and pruning the host plants in an appropriate way and intensity. Choosing the right host plants is the important factor for the sandalwood nurseries. The species and the time to plant host trees is a critical factor for success in seedling producing. The root of the seedling should not protrude out of the plastic bag, because this will inhibit seedling growth in the field. Therefore, the bigger the plastic bag size, the better the seedling growth.
3. It is important to arrange and check the humidity of the medium for germination and seedling periodically. Watering the seed can be done each two days. In the rainy season, the seedling must be protected with covering/shading by plastic material to hinder the splashing of rain drops so the humidity of the medium ramains favourable.
4. Optimal sunlight intensity is about 50%. The sunlight intensity can be arranged by using shade combinations. The most common shade materials used in nurseries are coconut leaf, imperata leaf and net shading.
5. To prevent fungi decay, the media should be sterilized or treated with fungicide on the seeds before sowing. Insecticide treatment with a *karbaril* active compound can be used to control leaf worm.
6. Capacity building can be done by a learning process and practicing of knowledge, skill and technology for sandalwood nurseries in a simple way and step-by-step, especially for the local communities. This capacity building can be targeted towards a small group community in the village which has been selected. Besides the technical aspect, the social, economic and environmental factors are also a part of the learning process. The final question for them is how to develop a sandalwood plantation in a small-scale forest and how to organize in their own land in the village.

CONCLUSION

The key issue for providing sandalwood seedlings is controlling and taking care of the nursery. The nursery should be located nearby to the plantation field to avoid destruction of the seedling during transport. High availability and low price of sandalwood seedlings will encourage people to establish sandalwood. Enhancing the knowledge, skill and technology for local communities is a critical element in the development of sandalwood in the nursery and in the field. Research planning of a cendana nursery model which addresses all the problems above is the important element for establishment of sandalwood plantations in semi-arid areas in West Timor.

REFERENCES

Ardjoyuwono, S. (1986), *Peranan Motivasi Dalam Rangka Peningkatan Produksi Kayu Cendana Di Propinsi Nusa Tenggara Timur,* Kertas Kerja Dalam Rangka Sepadya Departemen Kehutanan Ri, Tidak Di Publikasikan.

Harisetijono dan Sutardjo Suryamiharja (1991), *Sandalwood: Special Emphasis on Sandalwood of the Province of East Nusa Tenggara,* Savana No 6 Tahun 1991, Balai Penelitian Kehutanan Kupang.

Raharjo, S.A.S. (2006), *Kajian Sosial dan Teknis Pengembangan Cendana oleh Masyarakat di NTT*. Laporan penelitian, Balai Penelitian dan Pengembangan Kehutanan Bali dan Nusa Tenggara, Tidak dipublikasikan.

Rahayu, S, Wawo, A.H., Noordwijk, M.V., Hairiah, D.K. (2002), *Cendana, Deregulasi Dan Strategi Pengembangannya* , World Agroforestry Center – Icraf, Bogor., pp. 23 – 27.

Surata, I.K. (1990), *Pengaruh media semai terhadap perkembahan benih* cendana *(Santalum album*), Laporan teknis Litbang Kehutanan, Balai Penelitian Kehutanan Kupang.

Surata, I.K. (1993), *Pengaruh jenis inang terhadap pertumbuhan semai cendana(Santalum album), Santalum*, 9: 1-9.

Surata, I.K. (2006), *Teknik Budidaya Cendana,* Balai Penelitian dan Pengembangan Kehutanan Bali dan Nusa Tenggara, Kupang.

Widiyatmika, M. (1986), *Masalah Sosial Budaya Dalam Pengelolaan Kayu Cendana (Santalum Album L.) Di Propinsi Nusa Tenggara Timur,* Laporan Penelitian, Pusat Penelitian Universitas Nusa Cendana, Kupang.